DPoE™ Power System

User's Guide
Issue 1.0
Part Number: PN380

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Safety Warnings

The DPoE Power Patch Panel Power System is for use in restricted access locations only. It is suitable for mounting on concrete or other non-combustible surfaces.

Always observe standard safety precautions during installation, operation and maintenance of this product. Read the installation instructions before performing any work. Only a competent technician who is aware of the hazards involved should carry out adjustment, maintenance or repairs. Do not work on the system or connect or disconnect cables during periods of lightning activity. Ultimate disposal of this product should be handled according to all national laws and regulations.

WARNING:	**HAZARDOUS VOLTAGE AND ENERGY LEVELS ARE PRESENT THAT CAN PRODUCE SERIOUS SHOCKS AND BURNS**. Only authorized, qualified, and trained personnel should attempt to work on this equipment.

CAUTION:	The plug end of the cords used to connect to the Alternating Current (AC) source are considered to be the primary disconnect means, and reasonable access must be given to the plug and receptacle area. The receptacle must be fed with a breaker or fuse according to the instructions in this guide.

CAUTION:	ALL RECTIFIERS EMPLOY INTERNAL DOUBLE POLE/NEUTRAL FUSING

FCC Compliance Statement

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

WARNING:	Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

Warranty Information

Unless otherwise specified, all products presented in this user's guide are warranted against defects in material and workmanship for a period of one year from the date of invoice by *PANDUIT*® Corp. to the initial purchaser. During the warranty period *PANDUIT* Corp. will, at its discretion, either repair or replace products that prove to be defective. For warranty service or repair, the product claimed to be defective must be returned to a service facility designated by *PANDUIT* Corp. Buyer shall prepay all the shipping charges to *PANDUIT* Corp. and if, in the opinion of *PANDUIT* Corp., the product is defective, *PANDUIT* Corp. shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties and taxes for products returned to *PANDUIT* Corp. from another country. *PANDUIT* Corp. warrants that its firmware designed by *PANDUIT* Corp. for use with an instrument will execute its functions when properly installed on that instrument. *PANDUIT* Corp. does not warrant that the operation of the instrument or the firmware will be uninterrupted or error-free.

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer. Buyer-supplied firmware or interfacing unauthorized Modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance. No other warranty is expressed or implied. *PANDUIT* Corp. specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

The remedies provided herein are Buyer's sole and exclusive remedies. *PANDUIT* Corp. shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based on contract, tort or other legal theory.

Unless otherwise specified by *PANDUIT* Corp., opening this product by unauthorized personnel will void this warranty.

Trademarks

DPoE and Contour Crimp are trademarks of *PANDUIT* Corporation. All other trademarks are the property of their respective owners.

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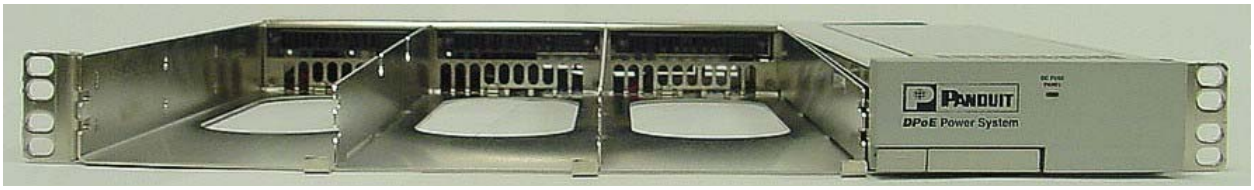
OVERVIEW

The DPoE™ Power Patch Panel (*PANDUIT* part number DPoE24U1X) provides a reliable and cost-effective solution for Power over Ethernet (PoE) applications, complaint with the IEEE 802.3af-2003 specifications or the alternate PoE (Cisco Legacy) specifications. Each DPoE Power Patch Panel allows centralized powering of up to 24 devices, such as Internet Protocol-based (IP) telephones, Network Security Cameras, or Wireless Devices, over the same cabling used to provide the Ethernet connectivity. Each DPoE Power Patch Panel fits into a 19" rack and occupies 1RU height.

The DPoE Power Patch Panels may be powered individually, such as with the *PANDUIT* individual power supply (*PANDUIT* part number DPoEPWRB120), which delivers 120 watts at 48 Volts of Direct Current (VDC) to a single DPoE Power Patch Panel. However, 120 watts may not be enough power to support all the Powered Devices (PD) connected to the panel. In these cases, or in cases of multiple DPoE Power Patch Panels, a larger power system is often required. One option is to use the *PANDUIT* DPoE Power Patch Panel Power System, herein referred to as the DPoE Power System.

The DPoE Power System uses a modular design to supply power at 48 VDC to the DPoE Power Patch Panel(s). The DPoE Power System consists of a chassis (*PANDUIT* part number DPoEPWRCU or DPoEPWRCM), which can accommodate up to 3 rectifiers of either 500 or 1250 watts each, depending on the current and future power requirements for the DPoE Power Patch Panels. The chassis can be equipped with an optional Network Interface Card (NIC) (*PANDUIT* part number DPoEPWRNIC).



The DPoE Power System accepts an Alternating Current Voltage (VAC) between 100 and 240 VAC (47 to 63 Hz) and produces a regulated output of 42 - 56 VDC capable of delivering a max of 100 Amperes (A) of Direct Current (DC) in an ambient operating temperature range of -40° Celsius (C) to +70° C. The default voltage setting is 54 volts. It can be adjusted through the Element Management System (EMS).

Table 1: DPoE Power Components Available from *PANDUIT* Corporation

	PANDUIT Part Number	Description
Individual power supply	DPoEPWRB120	Individual power supply - 120 watt power supply – 48 volt output
DPoE Power System	DPoEPWRCM	Managed power chassis - supports 3 rectifiers - equipped with Network Interface Card
	DPoEPWRCU	Unmanaged power chassis - supports 3 rectifiers - does not include Network Interface Card.
	DPoEPWRR500	500 watt rectifier for use in either DPoEPWRCM or DPoEPWRCU chassis
	DPoEPWRR1250	1250 watt rectifier for use in either DPoEPWRCM or DPoEPWRCU chassis
	DPoEPWRF10	10 amp fuse (package of 10)
	DPoEPWRNIC	Network Interface Card
	CORD-A	Power cord for Australia
	CORD-E	Power cord for Europe
	CORD-S	Power cord for USA
	CORD-U	Power cord for the U.K.

INSTALLATION

General Practices

Observe all local and national electrical, environmental, and workplace codes.

Each chassis should be fed from a dedicated AC branch circuit of a TN or IT power system.

CAUTION:	The plug ends on the power cords used for the AC connections are considered to be the primary disconnect means. Reasonable access must be given to the plug and receptacle area. The receptacle must be fed with a breaker or fuse according to *Table 4: Recommended AC Circuit Breaker and Wire Sizes*.

Use single hole, Underwriters Laboratory (U.L.) listed lugs for the bulk DC connection to prevent lug rotation and inadvertent contact with other circuits. Terminal strip connections use compression screws.

Class 1 wire is recommended for all DC connections.

Minimum wire sizes for protected and unprotected circuits are shown in *Table 5: Minimum Recommended DC AWG for 90° C Cabling for Unprotected Outputs* , respectively. In practice, loop voltage drop considerations will usually dictate larger than minimum safe wire size.

For connection and mounting torque requirements see *Table 6: Recommended Torque Settings*.

PANDUIT Corp. does not recommend shipping the chassis with the rectifiers installed. Rectifiers should be shipped in their separate boxes.

Package Contents

The DPoE Power system chasses (*PANDUIT* part number DPoEPWRCM or DPoEPWRCU) are shipped with the following included items.

Table 2: Package Contents

Item	Quantity	Notes
DPoE Power System User's Guide	1	This document. PANDUIT part number PN380
Cord Brackets	3	For securing the individual power cords to the rear of the DPoE Power System Chassis
Screws with integrated washers	4	For securing the DPoE Power System chassis to a 19" rack
Nuts	2	For securing the lugs to the bulk DC connection on the rear of the DPoE Power System chassis
Screws with integrated washers	6	#4-40 screws for securing the cord brackets to the back of the DPoE Power system chassis
CD-ROM	1	Element Management Software for the DPoE Power System (included with DPoEPWRCM only)

NOTE:	GMT fuses, which are installed as part of installing the DPoE Power System, are NOT included with the shipment. Fuses can be ordered in packages of 10 from *PANDUIT* (part number DPoEPWRF10). Fuses are also available from Littelfuse® and Bussman®. Their part numbers are as follows: Littelfuse® 481 series 10 Amp fuse; part number 0481010 Bussman® Fast-Acting Indicating fuse; part number GMT-10A

Heat Dissipation

The following table displays the maximum and typical British Thermal Units per hour (BTU/hr) of heat dissipated from each rectifier. The maximum is calculated at 90 VAC, and typical is calculated at 230 VAC.

Table 3: Heat Dissipation

Part Number	Typical BTU/hr	Max BTU/hr
DPoEPWRR500	249	410
DPoEPWRR1250	451	833

AC Input Wiring

The DPoE Power System chassis uses an individual AC feed architecture (See *Figure 1: Individual AC Feed Wiring Architecture*), which requires one AC feed per rectifier. The, up to three, AC connections are made using the IEC320 receptacles on the rear of the chassis (See *Figure 6: Chassis (Rear View) - AC Connections*).

Connect each feed, using the appropriate power cord as listed in *Table 1: DPoE Power Components Available* into the appropriate receptacle on the back of the system. Cord securing brackets are included to secure the AC plugs to the chassis (See *Figure 7: Securing Cord Bracket to Chassis*).

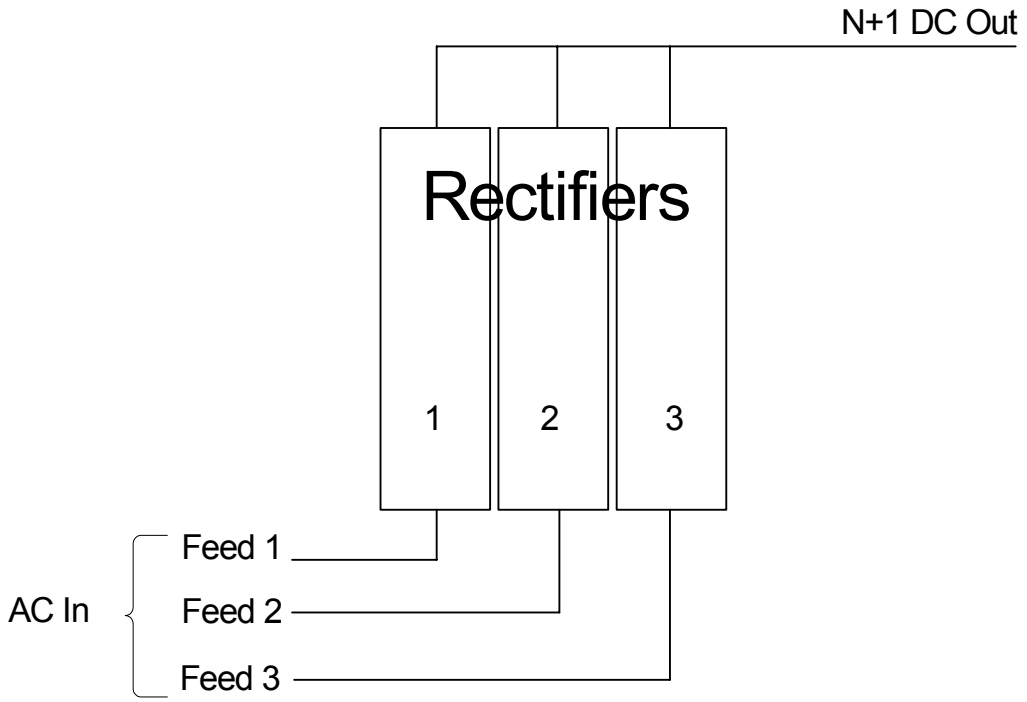


Figure 1: Individual AC Feed Wiring Architecture

Each individual AC feed should be protected using a circuit breaker as listed in *Table 4: Recommended AC Circuit Breaker and Wire Sizes*.

Table 4: Recommended AC Circuit Breaker and Wire Sizes

Type of Feed	Number of Rectifiers on an AC Feed	Part Number	Maximum Input Voltage	Maximum *Rated* AC Current (A)	Circuit Breaker Minimum value (A)	90° C Minimum Wire Gauge (AWG) to use at 30° C ambient
Individual AC Feed	1	DPoEPWRR500	90	7	15	14
		DPoEPWRR500	180	3.5	15	14
		DPoEPWRR1250	90	17.6	20	12
		DPoEPWRR1250	180	8.8	15	14

DC Output Wiring Sizing

There are two main considerations for sizing DC wire: ampacity and voltage drop. Ampacity refers to the safe current-carrying level as specified by U.S.-based organizations such as Underwriters Laboratories and the National Fire Prevention Association, which publishes the National Electric Code (NEC). Voltage drop is simply the amount of voltage loss in a length of wire due to ohmic resistance of the conductor. DC wire may be sized for either ampacity or voltage drop depending on branch load loop length and conductor heating. In general, ampacity considerations will drive wire selection for short loop lengths (less than 50 feet) and voltage drop will drive wire selection for long loop lengths (greater than 50 feet). The National Electric Code table 310.16 provides ampacity values for various sizes, bundles, and insulation temperature rated wire.

CAUTION:	ALWAYS FOLLOW NEC GUIDELINES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING DC WIRING AND PROTECTION.

Table 5: Minimum Recommended DC AWG for 90° C Cabling for Unprotected Outputs shows recommended wire sizes based on ampacity. The maximum current rating for the chassis is 100 A.

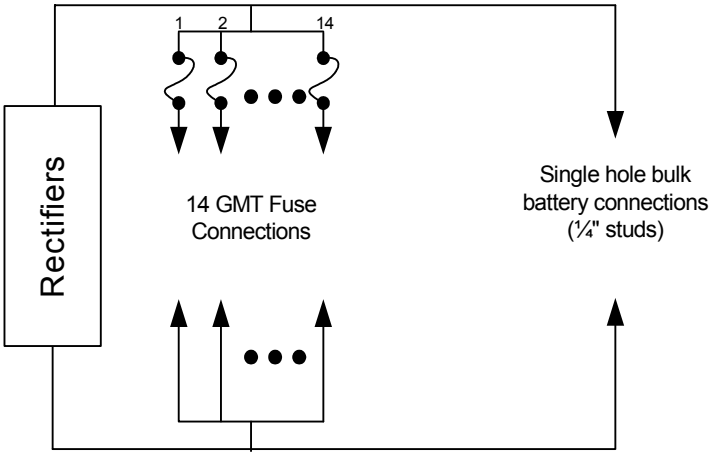


Figure 2: DC Wire Diagram

Each chassis is equipped with 14 GMT style fuse connections and an unfused bulk DC connection located on the rear of the chassis. The GMT fused connections are made on "lugless" terminal blocks with compression screws.

The bulk DC connection may be used as a battery input or as an unfused bulk output. The connections require a terminal lug (1/4" single hole lug with a max tongue width of 0.63" or less). Size wires based on the total rectifier capacity and choose conductor size according to *Table 5: Minimum Recommended DC AWG for 90° C Cabling for Unprotected Outputs* .

Connecting to a DPoE Power Patch Panel

Each DPoE Power Patch Panel is shipped with a keyed power connector harness and two butt splices (*PANDUIT* part number BSV14X) for use in connecting the panel to the power source. The butt splices included with the DPoE Power Patch Panel will support 14 - 16 AWG solid or stranded wire.

WARNING:	Connect each DPoE Power Patch Panel to the rear of the DPoE Power System using one of the 14 GMT-fused outputs per panel. DO NOT WIRE MULTIPLE PANELS TO A SINGLE OUTPUT ON THE DPoE POWER SYSTEM.

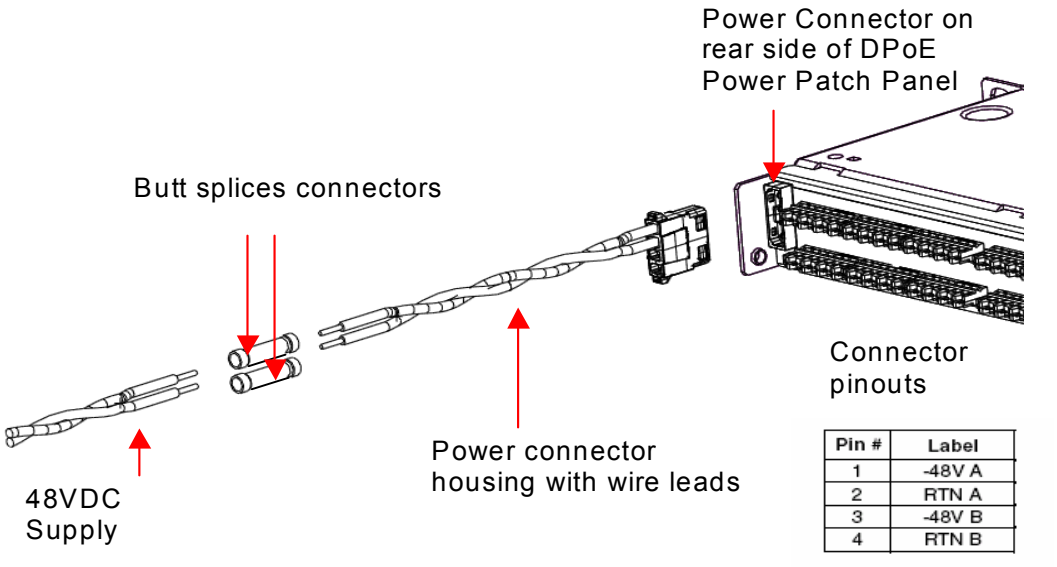


Figure 3: Connecting to a DPoE Power Patch Panel

NOTE:	The included power harness has two wires for the A-feed power only (pins 1 & 2). The DPoE Power Patch Panel supports an optional redundant B-feed power option, but the terminals and wire leads are not attached to the power harness. Contact *PANDUIT* Technical Support for more information about connecting the redundant B-Feed power.

WARNING:	The power supply connections on the DPoE Power Patch Panel are polarized. The DPoE Power Panel will not function if power is wired improperly.

Table 5: Minimum Recommended DC AWG for 90° C Cabling for Unprotected Outputs

Total Rectifier Current Rating (A)	Wire and Lug Gauge (AWG) using 90° C wire (NEC Table 310.16)[1]
10	16
20	14
25	12
30	12
40	10
50	8
75	6

Torque Settings

The following table shows recommended torque settings for all mechanical and electrical connections according to screw or nut size in inch pounds (in-lbs).

Table 6: Recommended Torque Settings

Screw or Nut Size	Toque (in-lbs)
4-40	6
6-32	12
8-32	22
10-32	37
12-24	50
¼-20	65

Required Tools

The DPoE Power System is designed to be installed with a minimum number of commonly available tools:

- #1 & #2 flat blade and Phillips head screwdrivers
- Torque wrench
- 7/16" socket, ¼" drive
- Wire and cable strippers (*PANDUIT* part number CT-100)
- Wire and cable crimpers (such as *PANDUIT* part CT-1550, CT-1551, CT-1570, CT-1700 Contour Crimp™ Controlled Cycle Crimp Tools) (used for optional bulk DC connection)

Site and Equipment Preparation

Prior to unpacking the DPoE Power System, note any physical package damage that could indicate potential damage to the contents. After removing DPoE Power System from the boxes and packing material, inspect for shipping and/or other damage. Any problems should be reported to *PANDUIT* technical support.

[1] Table 310.16 uses Table 3B – Sizes of Conductors from BS EN 60950:2000, "Safety of Information Technology Equipment," December 2000 for non-building wiring.

Table 7: *PANDUIT* Corporation Contact Information

PANDUIT Technical Support	Fax: 1-708-444-6993 E-mail: cs@panduit.com
For Installation Instructions in Local Languages and Technical Support	www.panduit.com/resources/install_maintain.asp
Worldwide Subsidiaries and Sales Offices	www.panduit.com

Have all tools, wire, cables, hardware, etc., within easy reach. To the extent possible, ensure a clean (free of debris, dust, foreign material, etc.) work environment. Care should be taken in the installation process to prevent wire clippings from getting into the equipment.

NOTE:	If possible, the rectifiers should remained sealed in their shipping boxes until the chassis wiring is complete.

Power Plant Mounting and Wiring

WARNING:	Ensure all AC and DC power sources are off and disconnected.

Mechanical Mounting

The DPoE Power System chassis is installed in a standard EIA 19" rack.

It is recommended that one person lift the chassis into the proper rack place while another person installs the supplied mounting screws. Tighten the screws with a torque wrench to the setting according to *Table 6: Recommended Torque Settings*.

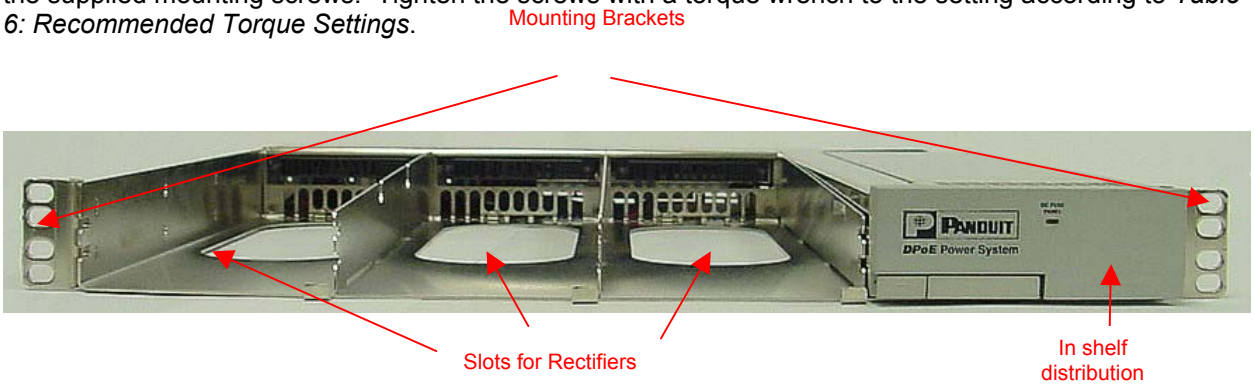


Figure 4: Chassis (Front View)

AC Input

Tighten the cord bracket around each IEC320 cord as shown in *Figure 5: Cord Bracket*. Plug the cord into the proper receptacle on the back of the chassis (See *Figure 6: Chassis (Rear View) - AC Connections*), then secure the cord bracket to the chassis using the provided screws (See *Figure 7: Securing Cord Bracket to Chassis).*

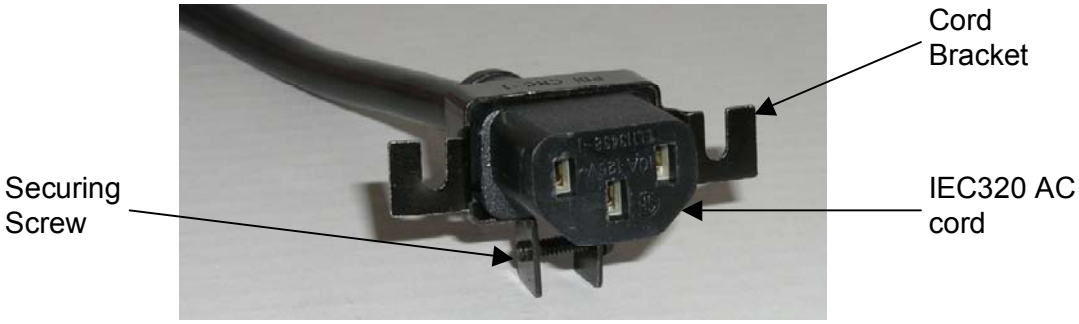


Figure 5: Cord Bracket

Figure 6: Chassis (Rear View) - AC Connections

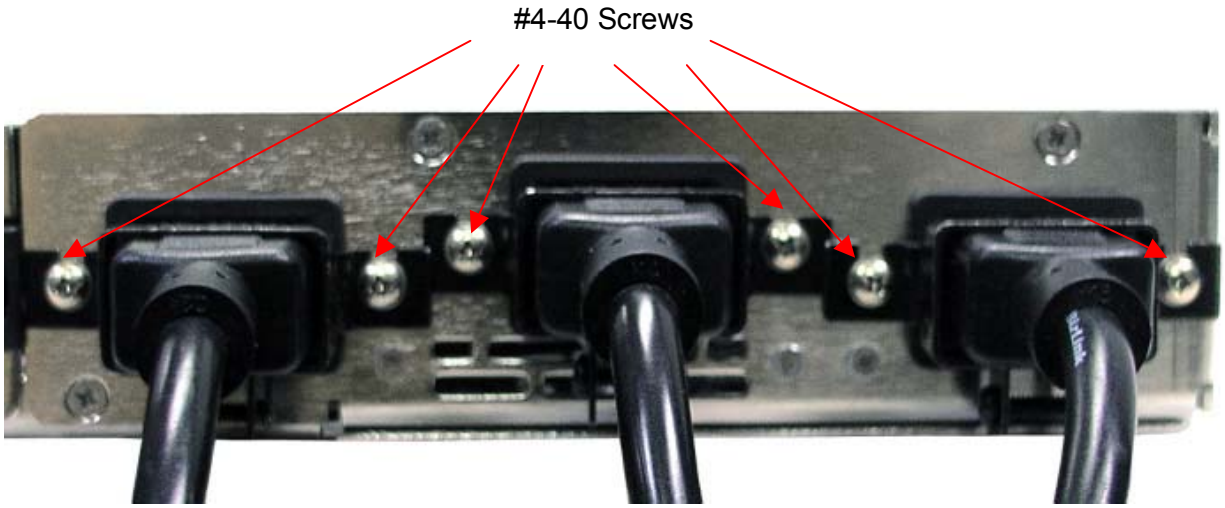


Figure 7: Securing Cord Bracket to Chassis

DC Output

DC connections are accomplished via the rear terminal blocks and bulk output connection as shown in *Figure 9: Chassis (Rear View) - DC Connections*. GMT-fused connections are accomplished via the rear compression screw terminal block that will accept wires sizes up to 12 AWG. Place wire in output and corresponding return, and compress the screws to 4 in-lbs. Place a fuse into the corresponding position into the fuse holder as shown in *Figure 8: Chassis (Front View) - GMT fuse holder*.

The DPoE Power System Chassis allows a bulk DC connection as shown in *Figure 9: Chassis (Rear View) - DC Connections.* The bulk DC connection may be optionally used to ensure continued power to the connected DPoE Power Patch Panels and the PD connected to the panels in the event of a power failure. This connection may be used as a battery input or as an unfused bulk output. The bulk DC connection requires properly crimped terminal lugs (1/4" single hole lug with a max tongue width of 0.63" or less). Terminal lugs (such as *PANDUIT* part number LCA4-14-L for use with #3 or #4 AWG stranded wire or #2 AWG solid wire) and crimping tools (such as the *PANDUIT* part numbers CT-1550, CT-1551, CT-1570, or CT-1700) are available from *PANDUIT* Corp. The bulk output terminals feature a break-off plastic piece to prevent inadvertent contact with the terminals. If using the bulk DC output feature, carefully break off each plastic tab before securing the terminal lugs.

Size wires based on the total rectifier capacity and choose conductor size according to *Table 5: Minimum Recommended DC AWG for 90° C Cabling for Unprotected Outputs* . For battery or bulk DC connections, place lug on the corresponding positive and negative studs, and secure the connections with the included nuts.

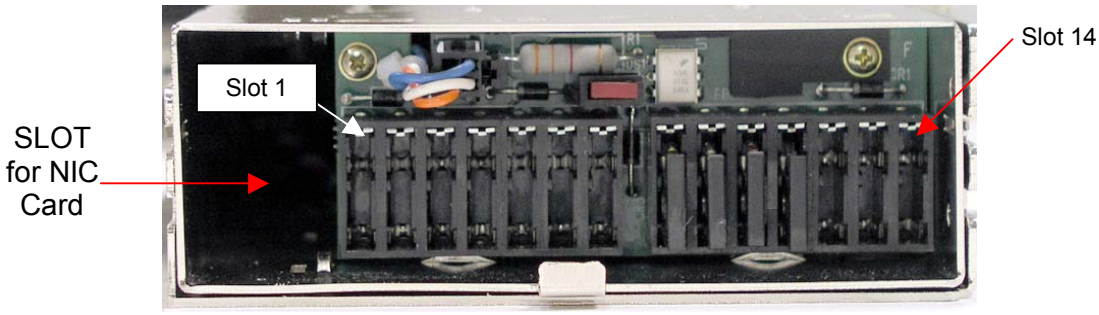


Figure 8: Chassis (Front View) - GMT fuse holder

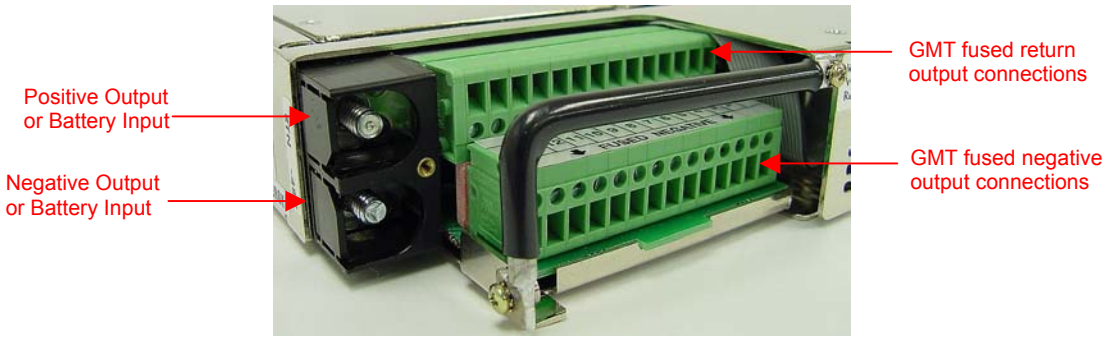


Figure 9: Chassis (Rear View) - DC Connections

Ethernet Connections

The Ethernet port on the back of the DPoE Power System chassis is used to provide the connection between the NIC card and the management system.

Test and Turn-Up

Power Up

Once all AC and DC connections have been secured and checked, install each rectifier sequentially by sliding and latching it into the chassis as illustrated in the section below.

Rectifiers

The rectifiers for use in the DPoE Power System are equipped with Light Emitting Diodes (LEDs) on the front panel as a means to indicate problems with that specific rectifier. The rectifiers are designed as modular, field replaceable units.

In the event that a rectifier needs to be removed, press the latch button on the front of the rectifier to release the latch handle. Pull the latch handle until the rectifier clears the rear connector on the chassis, then gently slide it out of the rear connector. With the latch handle open on the replacement rectifier, slide the rectifier in until it connects with the backplane. While pressing the latch button down, use the latch handle to gently ease the rectifier into the rear connector. When the rectifier is properly seated, releasing the latch button will hold the latch handle in place.

WARNING:	The latch handle must be open for installation or removal of a rectifier. Attempting to install a rectifier with the latch handle closed will result in mechanical damage to the rectifier and the DPoE Power System chassis.

The rectifier will power up and configure itself. It will start in high fan speed mode and reduce the speed according to the ambient and plant conditions within 10 seconds.

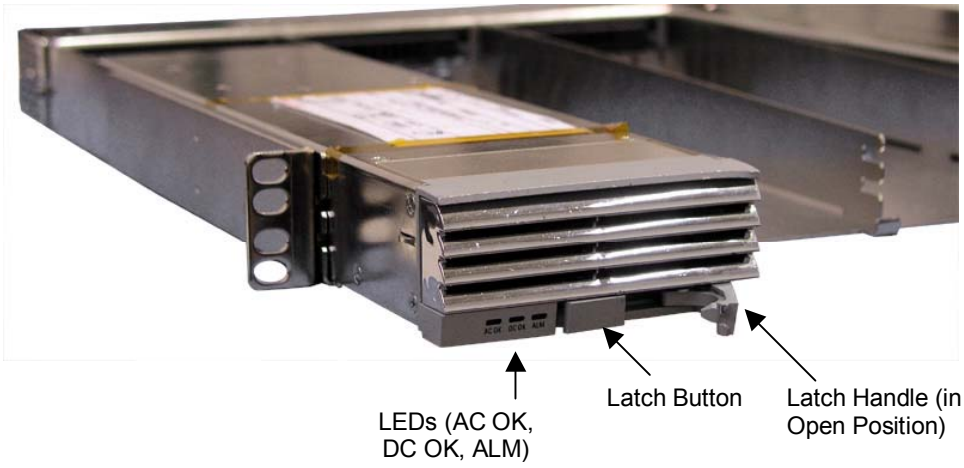


Figure 10: Installing or Removing Rectifiers

Short Circuit and Current Limit

I_{Limit} can be adjusted up to +105% of the rated current of the rectifier (See *Table 4: Recommended AC Circuit Breaker and Wire Sizes*). The system voltage will remain constant up to I_{Limit} at which point the system voltage will drop quickly toward 0 VDC, as shown in *Figure 11: Short Circuit & Current Limit*. Once a rectifier output drops below 12 VDC for more than 5 seconds, the system will shut down. The system will automatically restart after 60 seconds, and will continue until the short circuit is cleared.

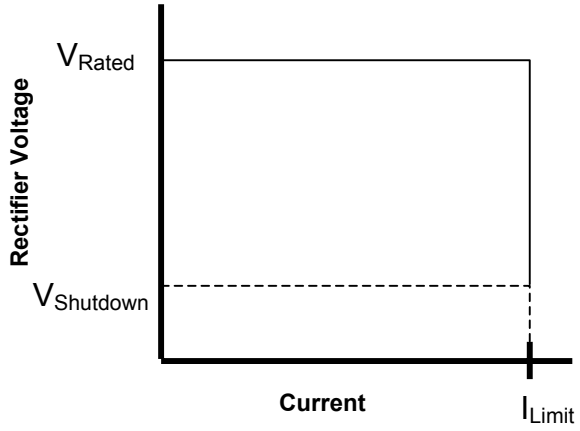


Figure 11: Short Circuit & Current Limit

Troubleshooting

The modular nature of this DPoE Power System makes diagnostics and repair easy. Make sure that all rectifiers are properly seated and latched into their respective slots. Make sure all power and signal connectors are properly mated.

Table 8: Troubleshooting

Alarm	Problem	Possible Solution
DC OK LED is extinguished	This rectifier has stopped outputting power	Rectifier failed. Replace this unit.
AC OK and all LEDs are extinguished	Commercial power has been lost to the specified rectifier(s)	Reset commercial circuit breaker to the dedicated AC circuit that feeds the system. Seek alternative power source until power is restored.
Fuse Open	A fuse is in the open state	Replace the open fuse

NIC Information

The *PANDUIT* DPoE Power System Chassis can be ordered with or without the NIC card. (PANDUIT part number DPoEPWRCM includes the NIC card. PANDUIT part number DPoEPWRCU does not). The NIC card allows the DPoE Power System to communicate with the management system. If a chassis is ordered and installed without a NIC card, it can be easily field upgraded to add the NIC card. *Figure 8: Chassis (Front View) - GMT fuse holder* shows where the NIC card is plugged into the chassis.

This following information is only applicable to chasses with NIC cards.

The NIC card can be connected via a standard straight through RJ45 patch cord (such as *PANDUIT* part number UTPCH3 or UTPSP3), through a hub or router, or via a crossover cord for direct connection. Additionally, the NIC card can be connected to the daisy chain of management connections used for the installed DPoE Power Patch Panels using a straight through RJ45 patch cord. Connect the NIC to the OUT management port on the last DPoE Panel in the chain.

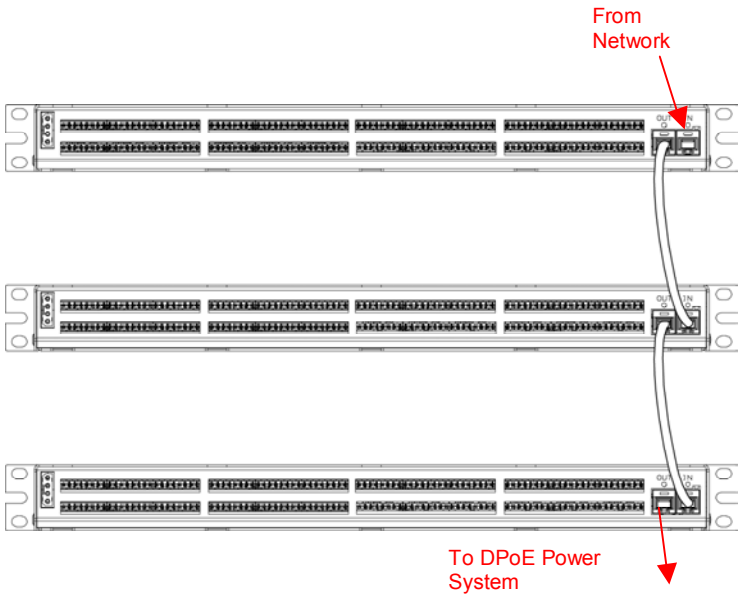


Figure 12: Connecting the NIC Card to the DPoE Power Patch Panel Management Port

Once a connection is made, connect to the DPoE Power System EMS Webpage via IPSetup.exe on the CD provided with the chassis (DPoEPWRCM only). The NIC card will also work with Telnet or SNMP.

NIC Card Settings

The NIC card comes equipped with the following default settings:

Table 9: NIC Default Settings

Parameter	Description	Default Setting
Float Voltage	The voltage to which the rectifiers will regulate the plant during float mode.	54 VDC
Rect CL Enable	Enables the system current limit feature.	Disabled
Rect CL Setpoint	The controller will limit the current of the rectifiers to this value.	200 A
HVSD Setpoint	The controller will shut down the rectifiers if the plant voltage exceeds this setpoint.	58 VDC
HVA Setpoint	The controller will issue a high voltage alarm if the plant voltage exceeds this setpoint.	57 VDC
BD Alarm	The controller will issue a battery-on-discharge alarm if the plant voltage falls below this setpoint.	48 VDC
BD TEST status	Enables or disables the battery test.	Disabled

Parameter	Description	Default Setting
BDT TIME MNT	Sets the length of time (minutes) that the battery test will run.	30 min.
BDT ALRM Voltage	Sets the voltage at which an alarm will be generated if the battery voltage falls below this level during the battery test.	52 VDC
BD ABRT Voltage	The voltage at which the battery discharge test will abort if the system voltage drops below this level.	42 VDC
BD TEST CONST	Sets the alarm constant for the battery test. 0 will disable thermal compensation effects during a battery test. 1 will take thermal compensation into account during the battery test.	0
T COMP status	Enables thermal compensation. Thermal compensation adjusts the float voltage of the rectifiers to increase or decrease the temperature of the batteries.	Disabled
T START T	The high temperature at which the controller activates thermal compensation.	35° C
T SLOPE T	The slope value at which the controller will reduce the float voltage per degree if thermal compensation is active.	72 mV/°C
STOP VLT V	The minimum voltage to which the controller will reduce plant voltage for thermal compensation.	50.5 VDC
T SENSE	Selects temperature sensing device to use for battery temperature compensation; Internal sensor or external temperature probes. The controller will autosense when an external probe is attached and automatically adjusts value to external.	External
TL START T	The low temperature at which the controller activates thermal compensation.	-20° C
TL SLOPE T	The slope value at which the controller will increase the float voltage per degree if low thermal compensation is active.	0 mV/°C
STOP VLT V	The maximum voltage to which the controller will increase the plant voltage for thermal compensation.	56 VDC
T RUNAWY T	The temperature at which the controller will activate thermal runaway.	60 °C
T RUNAWY V	The voltage to which the rectifiers will reduce for temperatures above T RUNAWAY T.	50 VDC
TEMP IS	Selects the units the temperature reading are given in either Celsius or Fahrenheit.	Celsius
BOOST status	Enables or disables the boost charge tests. The boost feature will increase the output voltage of the rectifiers for a short time, usually to charge the batteries.	Disabled
BOOST V	The voltage to which the boost charge test will increase, once the feature is activated.	56.5 VDC
BOOST H	The length of time (hours) the boost charge test will run.	12 hours
High temperature alarm threshold (NIC card only)	High temperature value at which the controller will trigger a HIGH TEMP alarm. (For systems using the NIC card only.)	98 °C

Parameter	Description	Default Setting
High temperature alarm release (NIC Card only)	The temperature value at which the controller will release a HIGH TEMP alarm. (For systems using the NIC card only.)	93 °C
Password	Administrator/User	5001